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Targeted Sediment Transport Model Development and Support for Tidal Flats DRI Researchers

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LONG-TERM GOALS

To supply Tidal Flats DRI investigators using unstructured grid models with sediment transport algorithms and modeling infrastructure developed by the National Oceanographic Partnership Program (NOPP)-funded Community Sediment Transport Modeling System.

OBJECTIVES

Support and targeted model development with the NOPP-funded Community Sediment Transport Modeling System (CSTMS) to Tidal Flats DRI researchers. This will include support for adapting the bottom boundary layer, surficial sediment and sediment bed model components of the CSTMS to unstructured grid hydrodynamic modeling systems, such as FVCOM, SUNTANS, ELCIRC and SELFE. The Tidal Flats DRI will benefit from a collaborative approach to implementing the CSTMS routines and model output infrastructure in Tidal Flats DRI models, minimizing new development effort for sediment transport components. The CSTMS project will benefit from broader field testing as well as feedback on performance and usability of these model components.

APPROACH

Although a variety of unstructured grid models may eventually be used in the Tidal Flats DRI, we are working initially with FVCOM (Chen, Beardsley and Cowles, 2006) and with Dr. Geoff Cowles from the FVCOM development team, as FVCOM has already been used successfully in the Skagit River and Puget Sound region by investigators at PNNL (Yang and Khangaonkar, 2008). The USGS will work closely with Cowles to ensure that the sediment routines are implemented consistent with CSTMS in an efficient and modular fashion. The results will be distributed using a THREDDS Data Server via OpenDAP with CF conventions, allowing users to access results from a variety of models using a standards-based approach.

WORK COMPLETED

We visited the Skagit field site and also met twice with Cowles to develop a plan for CSTMS implementation in FVCOM. We have have worked together with DRI investigators Cowles and Ralston to make preliminary FVCOM simulations available to other DRI investigators for field planning using model output interoperability infrastructure developed under the CSTMS project.

RESULTS

The results from the preliminary FVCOM simulations were delivered via the CSTMS infrastructure to Dr. Jamie MacMahon (and others) to plan drifter deployments for the Fall 2008 field program. Sediment transport algorithm improvement will follow successful assessment of the hydrodynamic model, currently being reconfigured and tuned to meet the needs of Tidal Flats DRI researchers in the Skagit River field site.

IMPACT/APPLICATIONS

The enhanced FVCOM sediment algorithms will be used by DRI unstructured grid modelers to allow simulations of waves, currents, sediment transport, and bottom morphology at the Skagit Tidal Flats DRI field site.

RELATED PROJECTS

This project is closely related to the NOPP Community Sediment Transport Modeling System Project.

REFERENCES

Chen, C, R. C. Beardsley and G. Cowles, (2006). An unstructured grid, finite-volume coastal ocean model (FVCOM) system. Special Issue entitled “Advance in Computational Oceanography”, *Oceanography*, **19**(1), 78-89.

Yang, Z, and T.P. Khangaonkar. 2008. " Modeling the Hydrodynamics of Puget Sound using a Three-dimensional Unstructured Finite Volume Coastal Ocean Model." In *Estuarine and Coastal Modeling*, ML Spaulding (ed). *Proceedings of the 10th International Conference* (accepted for publication). American Society of Civil Engineers, Newport, RI.